REQUEST FOR PROPOSALS
GEOTECHNICAL DATABASE DEVELOPMENT, PHASE II

PROBLEM STATEMENT

Geotechnical data has been collected by the Louisiana Department of Transportation and Development (LADOTD) for many years, however data access and interoperability is limited. This is due to several reasons: historical data collection/storage methods (hardcopy, etc.), prior lack of computing power, section isolationism, and/or lagging staff information technology training, etc. In recent years, advancements in information technology have allowed large amounts of data to be stored, managed, and accessed quickly with relatively simple tools. Recent efforts by LADOTD and the Louisiana Transportation Research Center (LTRC) have developed a Geotechnical Information Database, with a Geographic Information System (GIS) interface. The application connected many LADOTD data sources in a single application. For the first time, roughly two-thousand boring logs were available via the LADOTD Intranet and GIS server technology.

A previous LTRC project 03-1GT (www.ltrc.lsu.edu, Final Report #446), Development of a Geotechnical Information Database, was well received and spurred the desire that more information to connect to the system. The report included recommendations on maintenance, access, SiteManager (for both Construction and Materials input), and future data modules. It specifically stated,"*Enhancements to the website and application should be incorporated in phases so that the Geotechnical Information Database becomes an even more valuable resource. This project could expand into future studies by including data from other various sources to provide more information and details to designers. Moving forward, the actions taken now regarding document handling (scanning, saving, digital format, etc.) will benefit future modules and allow an easier transition and incorporation into a simple user interface like the GIS application.*"

The previous project's scope was limited to boring logs after 1998, and did not include older boring logs within the Design Section or the LADOTD General files. There is a need to retrieve this older information and/or add it to the network. However, the larger need is to develop and implement a digital system to improve and streamline the department's collection and storage methods of existing and future geotechnical data (including boring log data, pile/shaft information, driving records, test pile information, load test data, CPT, *etc*.) are desired. The information will aid in future exploration efforts, load resistance factored design (LRFD) calibration updates, design, *etc*. The results of this project are desired to provide quick access and interoperability to the existing Geotechnical GIS application (from 03-1GT) and other departmental analysis software.

The LADOTD Geotechnical Design Group requires the ability to track the status of project data within their section and in other sections that affect their decisions and productivity. Specifically, activities such as deep boring requests, drilling operations, testing and reporting, boring log generation, and design decisions must be tracked. These activities and their timing affect Bridge Design, Pavement & Geotechnical, and the Materials Laboratory Sections within LADOTD, and ultimately the efficiency of the Department, the timeliness of design, and project delivery.

OBJECTIVES

The objective of this research is to expand the development and functionality of the Geotechnical Database System to (in order of importance):

- Establish a plan and implement systems and methods to incorporate LADOTD geotechnical data into a digital management system, which provides the ability to access up-to-date data, and the flexibility to design reports for the selected data in order to aid further analysis (GIS applications, design software, etc.) The system should conform to the state of practice (other DOTs, DIGGS, etc.), and allow for future growth (i.e. additional modules and expansion). *(Approximately 70% Relative Importance)*

- Locate Geotechnical data within the LADOTD General files and import the data into a data format and location accessible to the existing GIS applications. These functions must be able to be automated in such a manner as to avoid unnecessary duplication of data. *(Approximately 20% Relative Importance)*

- Improve the efficiency of LADOTD Sections involved in acquiring geotechnical data (requests, scheduling, drilling, testing, & reporting, *etc*.) by establishing a tracking system to provide managers/groups the necessary data to make informed, timely, and accurate design decisions. *(Approximately 10% Relative Importance)*

TASKS

Task descriptions are intended to provide a framework for conducting the research. LTRC is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can realistically be accomplished within the constraints of available funds and contract time. Proposals must present the candidate's current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach.

Task 1. Departmental Records Research
a. Review the current data storage procedures used by the LADOTD Geotechnical Design Section, Materials Lab Geotechnical Group, and LADOTD as a whole. This task will include a review of the structures/data types and information that can be found within the current LADOTD databases including the location of boring logs, CPT files, pile/shaft information, driving records, test pile information, load test data, *etc*.
b. Review existing departmental software, processes, policies, and standards regarding the request, collection, testing, reporting, and analysis of geotechnical data. Contact Bridge Design, Pavement and Geotechnical Design, Information Technology, GIS, and the Materials Laboratory Sections at a minimum. Develop a flow chart outlining the process and show recommended modifications.
c. Develop a detailed work plan outlining tasks and recommended approach to accomplish objectives.

Task 2. Interim Report
a. Prepare an interim report outlining the structure, steps, and philosophy in the work plan to streamline the data recording and storage, transfer, tracking, and reporting processes.
b. Two months into the project, present a written and oral interim report to the Project Review Committee (PRC), outlining each phase and task.

Task 3. Future Records
Based on the results and approval of Tasks 1 and 2, develop a system to collect, import, store, and digitally manage deep boring data and associated information (pile/shaft information, driving records, test pile information, load test data, CPT files, *etc*.). Compatibility with the Geotechnical Information Database GIS website developed in 03-1GT and all Information Technology Section application standards, is required. System shall be compatible with LADOTD design programs and analysis software. The information will speed retrieval time, and aid future exploration efforts, load resistance factored design (LRFD) calibration updates, design, *etc*.

Task 4. Expand Functionality and Connectivity
Task 4.1 Develop the existing Geotechnical GIS system's potential as portal and simple interface for geotechnical and related information within the Department.

Task 4.2 Utilize and expand the capabilities of the existing department software. The LADOTD Materials Laboratory currently utilizes Geocomp equipment and Geosystems software for laboratory data; and gINT software for production of the boring log plan sheets. The department is also nearing implementation of the InfoTech's Site/Materials Manager: Laboratory Information Management System (LIMS). Update the boring log sheet template and generation process.

Task 4.3 Ensure simplicity and interoperability with LADOTD databases by working with the applicable Sections. The researcher should detail any necessary hardware or software recommendations. The researcher must adhere to the attached DOTD Web Application Development Standards and DOTD GIS Application Development Standards. Some available departmental databases include:

Content Manager: LADOTD's Electronic Document Management System. Content Manager is used for archiving documents, and long term document storage. These documents can be paper documents converted to electronic or electronic documents such as correspondence, proposal, contracts and plans. Note: 03-1GT stored older boring logs in content manager as PDFs, and the GIS system links to those documents.

Project Wise: LADOTD's Plan Management System. The main purpose of the system is to manage project plans as they proceed through the development lifecycle.

Share Point: LADOTD is looking to implement the Searches feature of Share Point and have the ability to search multiple sources at one time, such as My Documents, T: drive, web, Content Manager; and Team Sites. Each section should have their own site to share information and collaborate.

Falcon: DOTD's Plan Distribution System: Falcon is used to published the plans to the Internet before a job is let to contractors. Currently, the Plans are staying in Falcon, but they should be sent to Content Manager for permanent storage.

Task 5. Historical Records Research, import, and catalog deep boring historical data (prior to 1998) located in the LADOTD General files (hardcopy, microfiche, microfilm, CD, and DVD formats) into Content Manager, LADOTD's Enterprise Document Management System. A general description of the <u>current</u> process of obtaining the historical data from the LADOTD General Files is described below.

- Project numbers can be used to query the Media Index Tracking System (MITS) for Microfilm, CDs, and DVDs. The MITS database is housed on an LADOTD DB2 server, and is accessible by SQL query to locate archived data for each project.
- Cross-reference the Structures Master (STRM) data with the MITS data to locate available data.
- Microfilm: Several viewers are available which allow the user to browse though the microfilm file set and print out the desired sheets. A time estimate for data on the microfilm is estimated at 30 min per project to load, browse, and print out a boring log. This does not include time for scanning and including into the Geotech DB, as this is dependent on the number of actual boring logs found, and would be best accomplished after all data was retrieved.
- CD/DVD format: A portable/USB thumb drive is necessary to transfer data from the general files system to the user. This data is already in an electronic format, and can be easily associated with its Tracking of Projects (TOPS) project number, then put into the content manager/Geotech DB.

The Geotechnical Design section will provide a workspace and computer terminal to upload the data (boring log PDF file and reference data) to Content Manager.

Task 6. Develop a Tracking System
In conjunction with the LADOTD Information Technology (IT) Section, using IT standards, develop a system to track the progress of deep boring geotechnical data collection from start to finish that is accessible by involved LADOTD Sections. The tracking system goal is to improve transparency and accountability within the process, and aid in planning and scheduling. Contact those who request (Bridge Design and Road Design), collect (Pavement & Geotechnical Design), test and report the data (Materials & District Laboratories); and ensure full circle communication (digital tracking) back through to the design plans, and foundation and structural designers.

Note: The State of Louisiana, LaGov, is scheduled to go live on October 01, 2010 with Louisiana's Enterprise Resource Planning (ERP) project, (www.doa.louisiana.gov/ERP), which will bring one business system to the State.

LADOTD will be the pilot agency for Phase One. The new LaGov system is a strategic business initiative for Louisiana, using technology as a tool to provide more efficiency, transparency and accountability.

Task 7. Demo the Project.
The researcher shall provide live demonstrations throughout the progress of the project and be tied to project milestones. The demos are intended to show the capability, connections, etc. to the users and stakeholders who may help direct efforts on the project. The deliverables shall be complete after eighteen (18) months and be accompanied by a final demonstration to the Project Review Committee.

Task 8. Provide Training and Implementation Support.
The researcher shall provide training to applicable users and provide implementation support for six (6) months after project demo/delivery. This beta-testing support (time & funds) will start after acceptance of the PRC, and is designed to address initial-use hurdles and remedy any technical "bugs" which may arise during initial implementation. Training scope should be defined and funds should be documented as a separate budget item in the proposal.

Task 9. Provide a Final Report
The researcher shall provide a final report that documents the entire research effort, and make a summary presentation to the Project Review Committee (PRC) upon completion of the work. The report shall direct and recommend future steps toward the incorporation of other historical geotechnical documents within the LADOTD not addressed by this study. Document the research efforts so other areas can be addressed in subsequent research projects. A final draft report is due three (3) months prior to the project completion date for review and approval.

The report must document the procedures for maintaining the application and supporting databases. Flow charts should clearly identify the flow of data, as well as the individuals responsible for each step of the process. In addition, the report must identify who will be responsible for future technical support and training of users.

Deliverables
    a) The software structures, databases, connections, *etc.* must be installed and operational to the satisfaction of the PRC. Please refer to the attached LADOTD Web (and GIS) Application Development Standards.
    b) Training sessions to orient the users and IT Sections on the structure and use of the research product. Please refer to the attached LADOTD Web (and GIS) Application Development Standards.
    c) A Final Report that documents the entire research effort.

SPECIAL NOTES
    A.   The researcher(s) should have enough geotechnical experience to read and interpret boring logs and soil data, and have demonstrated experience in software and web application development, as well as computer systems used to analyze and interpret geotechnical data.
    B.   An opportunity to demonstrate the candidate's qualification and research approaches in front of the Project Review Committee is available upon request.
    C.   LTRC projects are intended to produce results that will be applied in practice. It is expected that the implementation of the results of this research into practice will evolve as a concerted effort during this project. The final report must contain an implementation plan to include as a minimum, the following:
        a.   The "product(s)" expected from the research;
        b.   A realistic assessment of risk due to impediments to successful implementation;
        c.   The activities necessary for successful implementation;
        d.   The criteria for measuring and quantifying the progress and consequences of implementation.

D.	To assist in the implementation process, the researchers shall present the final results to LA DOTD officials in an oral presentation to be held in Baton Rouge LA DOTD Headquarters after acceptance of the final report.

E.	The department will assist researcher(s) with acquiring temporary USER ID for the LADOTD domain, Content Manager, and other security access.

F.	The successful investigators shall conform the proposal and final report to the LTRC format. (available at: http://www.ltrc.lsu.edu/publications.html)

G.	The proposal should include travel to meet with the Project Review Committee for a "kick off" meeting, presentation of interim report, and presentation of the final report at a minimum. Other meetings at milestones and/or quarterly are preferred.

H.	Funding shall not be included for travel to conferences for presentation of results. Principal Investigator's may request support for conference travel funding outside the project budget.

I.	For specific questions regarding LADOTD sections and policy, questions should be directed to the LTRC contact via email, who will obtain the response and reply to the proposer.

ESTIMATED COST
$200,000.00

ESTIMATED COMPLETION TIME
Total estimated completion time and final report are due 24 months after initiation of the study.

LTRC PRIMARY CONTACT
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225-767-9110

AUTHORIZATION TO BEGIN WORK:
October 18, 2010 (estimated)

PROPOSAL FORMAT
All proposals are require formatting according to the LTRC Manual of Research Procedures available on the web site: www.ltrc.lsu.edu. Chapter 2 of that manual provides guidance on proposal development.

PROPOSAL SELECTION
The Project Review Committee selected for this project will review, evaluate, and rank all proposals received using the criteria established on the attached proposal review form.

DEADLINE FOR RECEIPT OF PROPOSALS
Ten copies of the proposal must be received by LTRC by the close of business September 1, 2010.
Proposals should be submitted to:

Harold R. Paul, Director
Louisiana Transportation Research Center
4101 Gourrier Avenue
Baton Rouge, LA 70808

ACRONYMS, ABBREVIATIONS, & SYMBOLS

CD	Compact Disc
CM	Content Manager (LADOTD Enterprise Document Management System - Archives)
DVD	Digital Video Disc
ERP	Enterprise Resource Planning (ERP) one business system for Louisiana
Falcon	Enterprise Document Manager, LADOTD's Electronic Plans Distribution Center
gINT	Geotechnical Integrator (Commercial Software), a Bentley Software Product
GIS	Geographic Information System
GPS	Global Positioning System
HQ	Headquarters
IT	Information Technology
LADOTD	Louisiana Department of Transportation and Development
LSU	Louisiana State University
LETS	LADOTD Projects about to be let out for bid.
LTRC	Louisiana Transportation Research Center
MaTT	Materials and Testing Tables Database System
PRC	Project Review Committee
Project Wise	LADOTD internal file sharing, a Bentley Software Product
Sharepoint	LADOTD internal file sharing, searchable and discoverable (tracks changes)
SSS	Subgrade Soil Survey
STRM	Structures Master (Internal LADOTD Database)
TOPS	Tracking of Project Systems (Internal LADOTD Database)
SMM & LIMS	Site/Materials Manager & Laboratory Information Management System

DOTD Web Application Development Standards

Purpose:

The DOTD IT Section has implemented standards for all web applications. Any web application developed for DOTD must comply with these software standards. By meeting these standards, contractors and developers will ensure that their work will be compatible with the existing DOTD IT infrastructure. Contract deliverables that do not comply with these standards cannot be assimilated into the DOTD IT system. In addition, applicable State of Louisiana, Office of Information Technology standards also apply.

This document is intended as a high-level overview and is not inclusive of all web application standards. The La DOTD's Web Standards and Best Practices documents will be provided on an as-needed basis.

Development Environment Standards for DOTD Web Applications:

Web Server OS: Microsoft Windows Server 2008 with IIS7. All web application must be compatible with this OS.

Development IDE: Microsoft Visual Studio 2008 SP1. Applications must be delivered in the form of a
Visual Studio, non-compiled solution including licensed copies of all dependent libraries and becomes the property of DOTD.

Approval and Registration of 3rd Party Components: All third party libraries must be approved and registered in the name of DOTD.

Software Standards for DOTD Web Applications:

All web applications must be built with **ASP.NET** and the **.NET 3.5 SP1** Framework (or newer) using the **Visual Basic.NET** programming language. ASP.NET MVC is not an approved framework.

The AJAX Control Toolkit Library may be included in any web application.

All Intranet web applications must be viewable and fully functional in **Internet Explorer 7** and above. All public web applications must be viewable and fully functional in all major web browsers.

Database Standards for DOTD Applications:

DOTD web applications must use **DB2** as the standard database management system. Approval to use **Microsoft SQL Server** will be given on an individual basis.

Documentation:

Specific documents will be identified in the contract.
- User Guide must be available online from within the application
- All design documents, installation instructions, and implementation guides must be delivered with the application

Development:

DOTD will provide the Master Pages and Style Sheets for web applications.

DOTD Standards must be followed in all web applications. The standards documents will be made available on a need to know basis. Applications developed on site must follow the DOTD software development life cycle and other DOTD processes.

Applications developed offsite must follow these guidelines:
- The Contractor will provide a scope of work to IT at the beginning of the project.
- The Contractor will involve the applications clients in all requirements gathering sessions.
- The Contractor will adhere to La DOTD's Web Standards and Best Practices.
- The Contractor will deliver all source code at least once a month to LA DOTD. La DOTD will then perform code reviews to validate web standards and best practices are being followed.
- The Contractor will perform adequate testing before the solution is transitioned to La DOTD. This includes but is not limited to unit tests, functional tests, integration tests, performance tests, and user acceptance tests. La DOTD IT personnel must be involved in all testing.
- For solutions that will be hosted by La DOTD, the solution must be deployed to the La DOTD staging environment where tests will be executed against La DOTD test data. The Contractor must provide documentation of the steps required to deploy the solution. The La DOTD project manager will be responsible for the deployment.
- The Contractor will be responsible for fixing all defects prior to transitioning the project to La DOTD.

DOTD GIS Application Development Standards

Purpose:

The DOTD IT GIS Unit has implemented standards for all applications using GIS. Any GIS application developed for DOTD must comply with these software standards. By meeting these standards, contractors and developers will ensure that their work will be compatible with the existing DOTD IT infrastructure. Contract deliverables that do not comply with these standards cannot be assimilated into the DOTD IT system. In addition, applicable DOTD IT and State of Louisiana, Office of Information Technology standards also apply.

All software must be developed and delivered using the current version of production software at DOTD.
All applications developed and hosted off-site must adhere to this requirement, before they can be migrated to the DOTD system.

Development Environment Standards for DOTD GIS Applications:
1. Microsoft Windows Server 2003 with IIS 6 is the web hosting standard for DOTD GIS.
2. Microsoft Visual Studio 2008 SP1 is the development environment standard for DOTD GIS.
3. Microsoft Silverlight 3 is the current version for development environment standard for DOTD GIS.
4. ESRI ArcGIS 9.3.1 SP1 is the GIS software standard for DOTD GIS.
5. Applications must be written in VisualBasic.NET, implementing code-behind pages for User Interface (UI) content.
6. All code modules need option strict and option explicit enabled.
7. Applications must be delivered in the form of a Visual Studio, non-compiled solution including licensed copies of all dependent libraries and becomes the property of DOTD.

Software Standards for DOTD GIS Web Applications:

1. Applications must use the ArcGIS API for Microsoft Silverlight/WPF to implement GIS User Interface (UI) components.
2. Applications must be developed for ArcGIS server 9.3.1 SP1 for the .NET Framework running on IIS 6.

Software Standards for DOTD GIS Non-Web Applications:

1. Any ArcGIS Desktop extensions or stand alone applications must use ArcObjects and ArcEngine version 9.3.1 SP1 where GIS functionality is needed.

DataBase Standards for DOTD GIS Applications:

1. The DOTD IT GIS Unit uses IBM DB2 and Microsoft SQL Server as its database standards.

DOTD will provide contractors and developers with style sheets, GIS data, and other information upon request.